pression may be applied to stratify risk in inferior MI patients.

11:30

790-5 Prognostic Significance of Different Patterns of Precordial ST Segment Depression in Inferior Wall Acute Myocardial Infarction

Yochai Birnbaum, Izhak Herz, Samuel Sclarovsky, Bruria Zlotikamien, Angela Chetrit, Gabriel Barbash. *Beilinson Medical Center, and Sheba Medical Center, Israel*

Previous studies have shown that ST depression in the precordial leads in inferior wall acute myocardial infarction (IAMI) is associated with increased in hospital mortality. However, no distinction has been made between maximal ST depression in the right versus left precordial leads. This study assesses the correlation between the pattern of precordial ST depression in the admission ECG and 30-day mortality in 1321 pts with IAMI. All pts were admitted within 6 hours from onset of symptoms and received either STK or tPA intravenously. Only pts with ST elevation ≥0.1 mV and positive T waves in at least two of the inferior leads were included. Pts were allocated into 4 groups: group A-no precordial ST depression (n = 346); group B-sum of ST depression in right leads (V1–V3) greater than the sum in left leads (V4–V6) (n = 700); group C-sum of ST depression in right leads equal to the sum in left leads (n = 162); and group D-maximal ST depression in V4–V6 (n = 113). A total of 48 pts (3.6%) died. The mortality for group A, B, C, and D were 10 (2.9%), 20 (2.8%), 7 (4.3%), and 11 (9.7%), respectively. Using logistic regression model, only the following parameters were found to be independent predictors for 30-days mortality:

	Odds Ratio	95% Confidence Interval
Sex (Females vs. Males)	2.39	1.15–4.94
Age (years): (60–69 vs. <60)	3.42	0.89–13.1
(≥70 vs. <60)	13.4	3.85–46.3
Previous Myocardial Infarction	2.33	1.11–4.89
Diabetes Mellitus	1.95	0.92–4.12
Killip on Admission (>1 vs. 1)	2.99	1.48–6.04
Peak CK Level (per 1000 IU)	1.28	1.02–1.61
Group B versus Group A	0.85	0.32–2.27
Group C versus Group A	1.72	0.55–5.37
Group D versus Group A	2.84	0.94–8.59

Conclusions: pts with IAMI and maximal ST depression in left precordial leads in the admission ECG, are at high risk for 30-day mortality, while ST depression in the right precordial leads (V1–V3) is not associated with increased risk.

11:45

790-6 The Incidence and Clinical Relevance of Bundle Branch Block in Patients with Acute Myocardial Infarction Treated with Thrombolytic Agents

Keith H. Newby, Andrea Natale, Mitchell W. Krucoff, Kenneth G. Morris, Kathleen Trollinger, Akbar Shah, Cindy Green, Nancy Wildermann. *VA Medical Center/Duke University Medical Center, Durham, NC*

In the pre-thrombolytic era the occurrence of new bundle branch block in the setting of acute myocardial infarction ranged between 6 to 12%. Whether thrombolytic therapy alter the incidence and clinical relevance of bundle branch block during acute myocardial infarction is unclear. In 324 consecutive patients with acute myocardial infarction admitted under the Gusto I protocol the incidence of new onset bundle branch block (BBB) was examined with respect to the infarct related artery (IRA). Each patient underwent continuous 12 lead ECG monitoring for a period of 24 – 72 hours using a system which stored any ST change persisting for more than 60 seconds.

Of the 324 patients, the overall incidence of BBB was found to be 28% (n = 91), transient BBB was seen in 24.3% (n = 79) of patients, persistent BBB in 3.7% (n = 12) and alternating right and left BBB in 2.2% (n = 7). When examined with respect to the infarct related artery, patients with LAD infarcts had a higher incidence of BBB as compared to those with infarcts in the RCA/Circumflex distribution (LAD 39% vs. RCA 26% and Circumflex 15.6%, $p < 0.05$). The occurrence of right or left BBB was not predicted based on the infarct related artery, being equally distributed in patients with LAD/RCA infarcts. Mortality in the overall population was 5% (n = 16). Persistent BBB, irrespective of the infarct related artery, was predictive of a higher mortality (33% = 4/12) than transient (5% = 4/79), or no BBB (3.4% = 8/233) ($p < 0.01$).

In conclusion: 1) In this population, the occurrence of persistent BBB is lower than previously reported. Whether this is secondary to the use of thrombolytic agents requires further evaluation. 2) LAD occlusion is associated with a higher incidence of BBB. 3) The occurrence of either right or left BBB was not predicted by the occluded artery. 4) Persistent BBB predicts a worse prognosis.

791 Revascularization — Variations by Region, Use of Resources and Appropriateness

Wednesday, March 22, 1995, 10:30 a.m.–Noon
Ernest N. Morial Convention Center, Room 64

10:30

791-1 Linear Relationship Between Rates of Percutaneous Transluminal Coronary Angioplasty and Rates of Coronary Artery Bypass Graft Surgery in the United States Medicare Population

Norman S. Kato, Deborah A. Meehan, Dianne H. Noble, Mehmet E. Ergun, Robert H. Brook, Grace M. Carter *UCLA Medical Center, Los Angeles, CA; RAND, Santa Monica, CA*

Invasive management of coronary artery disease (CAD) includes Percutaneous Transluminal Coronary Angioplasty (PTCA) and Coronary Artery Bypass Graft surgery (CABG). Indications for CABG and PTCA are well established. Whether PTCA alters the incidence of CABG is unknown. If PTCA is an effective invasive alternative to CABG, then where PTCA is aggressively performed, rates of CABG should be lower than in other locations with lower PTCA rates. We tested whether the performance of PTCA decreases the incidence of CABG comparing practice patterns in all 50 States. We examined the Medicare volume of PTCA from 805 hospitals and of CABG from 783 hospitals in the United States (US) from the Health Care Financing Administration (HCFA) database for 1992. Volumes of procedures were aggregated by State. Census data for population age >65 was obtained from the US Census Bureau for 1990. For all 50 States, as the rate of PTCA per 100,000 population age >65 (PTCA/100,000) increased, there was an increase in the rate of CABG per 100,000 population age >65 (CABG/100,000) ($r^2 = 0.67$, $P < 0.0001$) with rates of PTCA/100,000 and CABG/100,000 ranging from 89 to 831 and 299 to 1108 respectively. For the 10 States with the greatest population age >65 years, the relationship was similar ($r^2 = 0.84$, $P = 0.0002$) with rates of PTCA/100,000 and CABG/100,000 ranging from 130 to 503 and from 378 to 764 respectively. *We conclude:* 1) Rates of PTCA/100,000 and CABG/100,000 vary considerably from State to State despite established indications, 2) High rates of PTCA/100,000 are associated with high rates of CABG/100,000 suggesting that PTCA does not substitute for CABG in the invasive treatment of CAD, 3) Among the 10 most populous States, low rates of both procedures were associated with a Certificate of Need program and public disclosure of hospital and physician volume and mortality results for CABG surgery, 4) Appropriateness studies for PTCA and CABG should be performed on an individual statewide basis to further investigate the considerable inter-state variability.

10:45

791-2 Regional Variations in the Use of Cardiac Procedures After Thrombolysis: New England is an Outlier in the GUSTO Trial

Louise Pilote, Amanda Stebbins, Daniel B. Mark, Robert M. Califf, Eric J. Topol, GUSTO Investigators. *Cleveland Clinic Foundation, Cleveland, OH*

Background: Little is known about regional variations in the treatment of acute myocardial infarction (MI) after thrombolysis in the United States (US). *Methods:* We performed secondary analyses of the GUSTO data, a randomized trial of thrombolytic strategies. We compared use of cardiac procedures in 8 US regions (West, n = 2198, Great Lakes, n = 3155, Mid Atlantic, n = 3130, Mid South, n = 1724, Mid West, n = 2498, New England, n = 4369, South East, n = 3447 and South West, n = 2584). *Results:* Compared to other US regions, the proportion of patients undergoing cardiac procedures was lowest in New England (Table). Coronary angiography (CATH) use was lowest in New England (56%) and highest in the Mid South (86%). Coronary angioplasty (PTCA) use was lowest in New England (22%) and highest in the Mid West (36%). Coronary artery bypass surgery (CABG) was lowest in New England (10%) and highest in the Mid South (16%). These differences were not explained by demographic or clinical characteristics. The 30 day mortality and recurrent MI rates were similar across regions.

%	West	Great Lake	Mid Atlan.	Mid South	Mid West	New Engl.	South East	South West
CATH	67	80	73	86	77	56	79	77
PTCA	25	32	32	35	36	22	35	35
CABG	12	14	12	16	15	10	15	15
Death	6.2	6.7	7.2	5.5	7.7	6.8	7.6	6.0
MI	3.1	3.6	3.9	3.5	4.2	3.9	4.1	3.3

Conclusions: There are substantial variations in the use of cardiac procedures across the US. The lower use of cardiac procedures in New England

may be related to a more restrictive regional approach and does not appear to affect clinical outcomes including 30 day-mortality and recurrent MI.

11:00

791-3 The Influence of Clinical Risk Factors on the Use of Angiography and Revascularization After Acute Myocardial Infarction

John A. Spertus, Noel S. Weiss, Nathan R. Every, W. Douglas Weaver. *M.D. FACC, University of Washington, Seattle, WA*

After acute myocardial infarction (AMI), the American College of Cardiology and the American Heart Association recommend angiography in patients "if the prognosis is judged to be poor ... *and* ... outcome can be improved by urgent bypass surgery or coronary angioplasty (PTCA)." In 4823 consecutive survivors of AMI, we examined the relationship between both angiography (n = 2274) and revascularization (n = 692 for PTCA, n = 469 for bypass surgery) and 7 clinical variables that predict mortality (age, recurrent angina, ejection fraction, heart failure, use of thrombolytics, prior infarction, cardiogenic shock).

Multivariate logistic regression revealed that except for recurrent angina, most factors predicting higher mortality were associated with a lower use of angiography (OR(95%CI) = 2.75 (2.39–3.17) for recurrent angina, 0.47 (0.43–0.51) for older age, 0.85 (0.74–0.97) for prior infarction, 0.50 (0.43–0.59) for no thrombolytic treatment, and 0.63 (0.55–0.73) for heart failure during hospitalization). A similar relationship was observed among patients who underwent PTCA (OR(95%CI) = 1.94 (1.53–2.47) for recurrent angina, 0.51 (0.40–0.65) for low ejection fraction, 0.72 (0.57–0.93) for no thrombolytic therapy and 0.74 (0.56–0.98) for history of prior infarction). In contrast, patients with unfavorable prognostic profiles were more likely to undergo coronary bypass surgery (OR(95%CI) = 1.66 (1.34–2.06) for recurrent angina, 1.28 (1.11–1.47) for older age, 2.24 (1.78–2.82) for heart failure, 1.46 (1.18–1.80) for prior infarction and 1.28 for no thrombolytic therapy).

Angiography and PTCA are performed more often in patients who are at relatively low risk for subsequent mortality. Since there is currently no evidence of a survival advantage from PTCA, the risks of this procedure could be avoided in some patients by initially treating them conservatively and subsequently performing PTCA in only those patients whose symptoms are not controlled with medications alone.

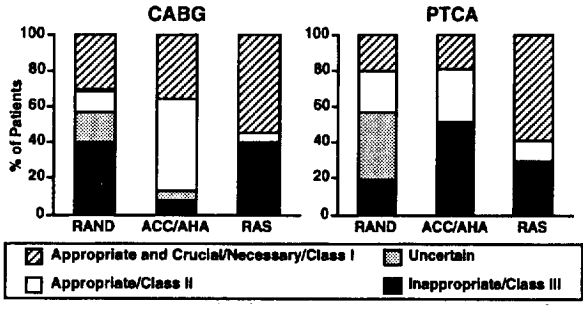
11:15

791-4 Prospective Assessment of Revascularization Appropriateness Scoring Systems: A Comparison of RAND Expert Panel Ratings, ACC/AHA Guidelines, and the University of Maryland Revascularization Appropriateness Score

Michael A. Lauer, Andrew A. Ziskind, Cynthia C. Lemmon, Robert A. Vogel *University of Maryland, Baltimore, Maryland*

Although different scoring systems have been used to evaluate the appropriateness of PTCA and CABG, they have not been directly compared. For 100 patients referred to the catheterization laboratory, we prospectively compared the RAND Expert Panel Ratings, ACC/AHA Guidelines and the University of Maryland Revascularization Appropriateness Score (RAS). The patient population included stable angina (25%), unstable angina (33%), post-MI (27%), acute MI (7%), asymptomatic with + ETT or pre-op (7%), and sudden death (1%). Pts were treated with PTCA (62%), CABG (19%), or medical therapy (19%).

There were significant differences among the 3 systems for PTCA and CABG appropriateness. ACC/AHA and RAS were more definitive in assigning revascularization scores than RAND which yielded uncertain ratings in 17% for CABG and 38% for PTCA. ACC/AHA differed markedly in the Inappropriate/Class III rating for both CABG and PTCA.



Conclusion: Marked differences are present among these 3 scoring systems. Factors contributing to these differences should be clarified before they are widely applied to patient care.

11:30

791-5 Physician Profiles of Coronary Revascularization in the Emory Angioplasty vs Surgery Trial: Understanding Physician Differences Using Resource-based Relative Values

Edmund R. Becker, Patrick D. Mauldin, William S. Weintraub, Spencer B. King III *Divisions of Health Policy and Management, and Cardiology, Emory University, Atlanta, GA*

Understanding the reasons for variations in physician resource utilization in coronary angioplasty (PTCA) and coronary surgery (CABG) is essential to efficiently organizing, managing, and paying for these procedures. To evaluate the extent of variations in physician resource utilization for CABGs and PTCAs and the reasons for these variations, the resource-based relative value scale (RBRVS), an index of relative weights for physician work and practice costs, is used to evaluate physician practice patterns. Given their extensive clinical review, RBRVS weights represent new, unique, comprehensive measures of physician resource utilization where 1 unit value is equivalent to an intermediate office visit for an established patient. Our investigation uses 3 years of clinical and financial data on 392 randomized patients with multivessel coronary artery disease (EAST data), receiving the initial therapy of either CABG or PTCA. RBRVS weights are assigned to each procedure code (CPT) and the distribution of RBRVS units and their allocation among different types of services are analyzed. Results show significant differences in physician resources for both CABGs and PTCAs. Among CABG patients, nearly a ninefold variation in physician resource units is evident (108 ± 46) and, for PTCA, a 29-fold variation exists (66 ± 54). At three years, the average physician resource utilization for CABG is 64% greater than PTCA. Significant differences are also evident in surgical, laboratory, imaging, and consult resources even after accounting for casemix. The findings demonstrate that the RBRVS is a viable and useful analytical tool for managerial and clinical personnel.

11:45

791-6 Prospective Application of RAND Expert Panel Ratings, ACC/AHA Guidelines, and the University of Maryland Revascularization Appropriateness Score (RAS): Only RAS Predicts Clinical Outcome

Andrew A. Ziskind, Michael A. Lauer, Cynthia C. Lemmon, Robert A. Vogel *University of Maryland, Baltimore, Maryland*

Several scoring systems exist for evaluating the appropriateness of PTCA and CABG. However, they have not been prospectively correlated with outcome. We prospectively studied 61 pts referred to the catheterization laboratory who were treated with PTCA (33), CABG (15) or medical therapy (13). Forty-five were male; the mean age was 60.2 ± 12.8 years (range 32–87). During a mean followup of 9.3 ± 3.8 months (range 3–16.1), 66 events occurred in 35 patients including angina (25), MI (3), death (6), cardiac readmission (17), PTCA (4), CABG (7), CHF (4).

For all patients, revascularization appropriateness was ranked by the RAS, ACC/AHA, and RAND Scoring systems. Application of RAS yielded revascularization appropriateness ratings of Necessary (N), Appropriate (A), or Inappropriate (I). Of 11 patients ranked N who did not receive revascularization, 10 had adverse events, compared with 17 of 35 who received revascularization ($p = 0.02$). Of 5 pts ranked I for revascularization who received either PTCA or CABG, 3 had adverse events. In total, 13 of 16 pts who received treatment that was discordant with a N or I RAS rating had adverse events, compared with 20 of 45 who received concordant treatment. ($p = 0.02$). These discordant treatments included unnecessary PTCA (5), failure to perform CABG (1), PTCA (3), or either (7). Statistical significance persisted when only "hard" events (excluding angina) were considered ($p = 0.03$). Concordance of treatment with RAND and ACC/AHA revascularization appropriateness scores for PTCA and CABG were not predictive of adverse events in this population.

Conclusion: Revascularization appropriateness scoring systems differ in their ability to predict outcomes. Of the 3 approaches studied, only treatment concordant with RAS treatment recommendations reduced subsequent adverse events.